

## **REMARKS**

This Request for Reconsideration is in response to the Final Office Action mailed May 30, 2008. Claims 1-11 were rejected.

### **Claim Rejections - 35 U.S.C. § 102**

Claims 1-10 (including independent claim 1) were rejected under 35 U.S.C. § 102(b) as being anticipated by McEwen (US 3,516,248).

Applicant respectfully asserts that the McEwen reference fails to disclose a steam cycle with a steam generator that transfers thermal energy to water-based operating medium and a power engine adapted to convert the thermal energy comprised in the operating medium to mechanical energy.

The office action asserts that because water is listed on column 5, table II, that water along with other compounds is taught by McEwen, and also that since McEwen discloses that mixed fluids can be used, a water based mixture is disclosed. However, Applicant disagrees with the Office Action because column 4, lines 69-72, and column 5, lines 12-18, explain that fluorocarbon refrigerant 12 and water are included in column 5, table II, only for comparing the cycle efficiencies of the inventive compounds. Indeed, column 5, lines 12-18, indicate that the six compounds listed below water are the six exemplary organic fluids of the McEwen reference, and that the high efficiency of water is “offset by the disadvantages caused by the deficient entropy characteristics of steam” (see column 5, lines 17-18).

Instead, McEwen discloses a Rankine cycle using certain sulfur-free, non-halogenated organic compounds. Pyridine and Pyrrole are specifically disclosed as a working medium. Additionally, McEwen refers to low temperature ORC fluids that are particularly advantageous for recovering and converting heat energy to mechanical energy from relatively low level heat sources (Column 3, line 3-5). Thus, the disclosure of McEwen provides for working media which are suitable to replace water in a Rankine cycle rather than be added to water in a steam cycle.

As pointed out in section [0014] of the description of the present application, it is an object of the invention to provide a frost-proof steam cycle with high efficiency without

additional energy requirement. Clearly, McEwen's low level heat sources and fluids are not used to avoid freezing while, at the same time, allowing the use in steam cycles at very high temperatures.

Thus, the elements of a water-based operating medium containing at least one heterocyclic compound are not taught in the McEwen reference, and such compounds provide the advantage of being usable in frost-proof steam cycles which are naturally operated at very high temperatures.

Therefore, Applicant respectfully submits that independent claim 1 is allowable, and urges the Examiner to withdraw the rejection. Claims 2-10 are allowable for at least their dependence on an allowable independent claim.

### **Claim Rejections - 35 U.S.C. § 103**

Claims 1-11 were rejected under 35 U.S.C. § 103 as being unpatentable over Zimron et al (US 6918252) in view of Tincher et al (US 4,342,658).

The Zimron and Tincher references, when combined, do not teach or suggest all of the elements of independent claims 1 and 11. Specifically, the Zimron reference does not teach a steam cycle for a steam generator including a water-based operating medium containing at least one heterocyclic compound, and the Tincher reference does not overcome that deficiency.

Instead, Zimron discloses an organic Rankine cycle (ORC) power plant using an organic working fluid such as pentane or isopentane (Column 1, line 33-34). Such hydrocarbons are thermally unstable at high temperatures which are necessary to operate the steam cycle of the present invention. Working fluids used in ORCs are not well suited for use in high temperature steam cycles. Furthermore, organic Rankine cycles explicitly do not use steam because the boiling point of water is too high for such cycles. ORCs are specifically designed to use low temperature heat sources. The reason to use organic compounds is not their potentially lower freezing point but their lower boiling point. As organic compounds used in ORCs are thermally unstable they are explicitly excluded from use in steam cycles which are naturally operated at very high temperatures. Thus, as noted by the Examiner, Zimron does not describe the use of a water based fluid in a steam cycle as it is claimed in independent claims 1 and 11.

Furthermore, Tincher does not overcome Zimron's deficiency because Tincher does not teach a steam cycle for a steam generator including a water-based operating medium containing at least one heterocyclic compound. The Office Action states that Tincher is relied upon to disclose it is well known to use 2-methyl-pyridine mixed with water for inhibiting corrosion. However, even if this were true, Applicant fails to see how this overcomes the deficiencies of Zimron noted above.

Niether Zimron nor Tincher teach the use of a water-based fluid as a working medium in a steam cycle. Tincher discloses 2-methyl-pyridine for use as a hydraulic fluid or metalworking lubricant, but not as a working medium in steam cycles. It is unclear to applicant how Tincher's disclosure of 2-methyl-pyridine as an incompressible hydraulic fluid would cause one of skill in the art to extrapolate its use to a compressible working medium fluid for a steam cycle.

Additionally, as noted above, section [0014] of the description, states that it is an object of the present invention to provide a frost-proof steam cycle with high efficiency without additional energy requirement. While Tincher teaches anti-wear properties, pressure performance, metal corrosion resistance, water solubility and lubricity it does not teach its use to avoid freezing while, at the same time, allowing its use in steam cycles at very high temperatures.

Moreover, as noted in the previous Office Action, combining Tincher with Zimron is improper because Zimron teaches ORCs which are specifically designed not to use water while the hydraulic fluid of Tincher is water-based. Due to its thermodynamic properties the fluid disclosed by Tincher is not suitable for the low temperature Rankine cycle of Zimron. Furthermore, Tincher has not recognized that the addition of, for example, 2-methyl-pyridine will lead to lower freezing point, and yet provide sufficient thermal stability.

However, even if such a hydraulic fluid was used as a working medium in the Rankine cycle of Zimron, the result would still not be a steam cycle as claimed in the present application because such a steam cycle is operated at much higher temperatures of typically 550°C than the ORC-systems disclosed in any of the cited references which are operated at much lower temperatures of below 400 °C.

Therefore, Applicant respectfully submits that claims 1-11 are allowable, and urges the Examiner to withdraw the rejection.

Claim 11 is rejected under 35 U.S.C. § 103 as being unpatentable over McEwen (US 3,516,248) in view of Tincher et al (US 4,342,658).

The McEwen and Tincher references, when combined, do not teach or suggest all of the elements of independent claims 1 and 11. Specifically, as noted above, the McEwen reference does not teach a steam cycle for a steam generator including a water-based operating medium containing at least one heterocyclic compound, and the Tincher reference does not overcome that deficiency. Instead, McEwen teaches an organic Rankine Cycle the does not use a water based working medium and which operates at low level temperatures that are not frost free. Tincher discloses a hydraulic fluid, but does not teach a steam cycle of any kind, nor does it teach a water based hydraulic fluid that could be used in a high temperature, frost free steam cycle.

However, even if the H<sub>2</sub>O and 2-methyl-pyridine mixture itself was known at the time of the priority date of the present invention the person skilled in the art would not consider such a mixture as disclosed in Tincher for the use in an organic Rankine cycle (ORC) as disclosed in McEwan. McEwan addresses the problem of thermal stability (Column 4, Line 39) and yet does not solve this problem by using water for water enables and requires temperatures much higher than those applied by the low level heat sources which are disclosed in this document (Column 3, line 5-6). Thus, combination of McEwen and Tincher is improper and does not result in the combination of elements claimed in claim 11 of the present invention.

Therefore, Applicant respectfully submits that claims 11 is allowable, and urges the Examiner to withdraw the rejection.

### CONCLUSION

In light of the above, Applicant respectfully submits that pending claims 1-11 are in condition for allowance. Therefore, Applicant requests that the rejections and objections be withdrawn, and that the claims be allowed and passed to issue. If any impediment to the allowance of these claims remains after entry of this Amendment, the Examiner is strongly encouraged to call Robert L. Lundstrom or Robert R. Mallinckrodt at (801) 566-6633 so that such matters may be resolved as expeditiously as possible.

The Commissioner is hereby authorized to charge any additional fee or to credit any overpayment in connection with this Amendment to Deposit Account No. 20-0100.

DATED this 30th day of July, 2008.

Respectfully submitted,



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